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Plant Problems in Relation to Diseases of Livestock*

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Our knowledge of the harmful effects of vegetation on animals is mainly limited to a study of plants which are known to contain poisonous alkaloids or irritant substances. For instance, it is well known that yew is a deadly poison because of the alkaloid taxine found in the plant, and that certain members of the buttercup family are injurious since they contain a blistering oil liable to cause severe gastro-enteritis if eaten in sufficient quantity. These poisonous plants are usually only eaten under certain circumstances, and even then there may be factors which determine whether or not symptoms of poisoning develop. In addition to violent organic disturbances resulting from poisoning, some plants, such as St. John's wort, have a selective effect on tissues, producing conditions like photosensitisation which is characterised by pruritus and fear of light.

There are also a number of common diseases in which plants are to some extent concerned, *e.g.*, grass staggers, sweet clover disease, disease following the feeding of sugar beet tops, urinary troubles in lambs fed on roots, etc. It may be somewhat unorthodox to include these conditions, some of which are characterised by a physiological disturbance, in an address on poisonous plants, especially as they occur when feeding animals on nutritious pastures or on crops which are grown for animal food. Nevertheless, it must be granted that the development of these diseases is in some way related to the herbage, and a study of the suitability of certain crops for the different species of animals under varying conditions might be well repaid. For example, research work has shown that sweet clover disease, a haemorrhagic condition which occurs in American cattle grazed on one of the Leguminacae (*Melilotis altissima*), is due to the large amount of coumarin in the plant, and in this country it is well known that sugar beet tops cause illness because of the high oxalic acid content, and milk taint sometimes results when lactating cattle are fed on them because of the betaine they contain[1]. Fortunately, the oxalic acid content can be reduced by allowing the leaves to wilt, a practice which makes the feeding of this food possible. We have much to learn regarding these feeding and husbandry problems, and I feel that further work is especially needed as new plants come to be used for feeding on our farms and fresh methods of management are adopted. Such a study would obviously necessitate the collaboration of the clinician, pharmacologist, agriculturalist and botanist.

The diagnosis of plant poisoning is often difficult, especially as only with a few poisonous species are pathogenic lesions present. Many practitioners tend to incriminate plants without sufficient evidence, and this often leads to conflicting accounts in the literature. An opinion should be expressed only after a very full consideration of the circumstances and the exclusion of other diseases. It must also be pointed out that the submission to a laboratory of ingesta for analysis is often a valueless procedure, unless some indication of the poison suspected can be given to the analyst.

FACTORS INFLUENCING THE DEVELOPMENT OF POISONING

Changes in Agricultural Practice.—There are obviously many ways in which farm management may have an influence, *e.g.*, the neglect of drainage may result in the appearance of water-loving plants such as water dropwort, hemlock (*Oenanthe crocata*) and *Ranunculus flamula*, while, following failure to cultivate and remove weeds, ragwort and bracken may become plentiful. Thus these two plants are especially troublesome in times when agriculture is neglected. Problems may develop for less apparent reasons; for instance, much of the hay formerly produced in the marshes of eastern Norfolk was sold to London merchants for horses. It contained a considerable percentage of horsetail (*Equisetum*), which has little effect on equines, but, since nowadays it is fed locally to cattle, samples containing 10 per cent. are liable to cause severe diarrhoea and a drop in the milk yield. It is also well known that poisoning occurred in horses when peas imported from Russia were contaminated with mutters, (seeds of *Lathyrus sativus*) and the recent practice of feeding husks of the cocoa bean has given rise to much trouble.

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Starvation.—When there is ample herbage, animals at pasture will not usually eat poisonous plants or shrubs, but they often ingest them in times of drought or when the land is snow covered. Cases of rhododendron and yew poisoning usually occur, therefore, in the winter. The celery-leaved buttercup (*R. scleratus*) is only eaten when the ponds are dry, while trouble from acorns almost invariably coincides with a dry autumn. Again, animals which are short of food will often eat things like wood bark, and it seems possible that some cases of bark poisoning may occur in the winter months. The knowledge regarding the toxicity of various barks is not extensive, but they contain a considerable amount of tannic acid which can set up symptoms of acute enteritis if eaten in large amounts.

While, under normal conditions, animals usually reject poisonous plants, this discrimination should not be relied upon altogether, especially in the early spring. For instance, the flowering heads of ragwort are often prominent on pastures, encouraging the belief that it is never eaten, but we have evidence that it is frequently ingested when it is young and also later as hay. Since the active principle is cumulative, and a small daily dose will set up the disease, it can readily be understood why many cases occur annually in East Anglia. Another point which should be considered regarding ragwort poisoning is the long interval which may elapse before symptoms appear.

Stage of Growth.—There is no definite evidence that the toxicity of any of the British weeds is greater at any given period of their growth, but it is interesting to note that many cases of poisoning by *Mercuralis perennis* have been recorded in the spring and none in the autumn. In S. Africa Steyn (1932) found that the toxicity of *Cotyledon orburlata* varies during the year, the most toxic period being during the hot months, that is November to February. The nicotine content in a mature leaf is six to eight times the amount that is in a seedling leaf.[2]

Some vegetable foodstuffs are definitely toxic at certain stages of their growth. It is well known that potatoes are poisonous when they are sprouting, and in this state serious illness may result if they are fed, even after cooking. Ogilvie[3] (1943) claims that the toxic principle, solanin, is present in the tuber of sprouting potatoes, and states that they must not exceed 25 per cent. of the ration, though the sprouts have been removed. The possibility of poisoning from potatoes should obviously be borne in mind now that they are fed so extensively, especially to pigs.

Mustard is a crop which is poisonous in the seeded state. Sheep are not infrequently folded on mustard, so that this practice should obviously be restricted to the period before it reaches an advanced stage of growth. In the outbreaks investigated by us, the sheep have shown gastro-enteritis, and death has resulted from *Cl. welchii* infection.

Very little is known regarding the part played by herbage in the aetiology of diseases like grass staggers. Hoven is well known to occur most frequently in meadows where clover is abundant, especially when there is a rich young growth. Moisture may influence its development, and it has recently been shown that leguminous plants yield an abundance of H_2S in the rumen[4]. Grass staggers is obviously a vague term used to include diseases which occur principally amongst animals recently turned out to pasture. While there is little definite information regarding this group of diseases, there is evidence that one variety of hypomagnesaemia occurs principally during the first weeks of grazing, and affects particularly cattle in certain districts. Again, nothing is known regarding the part played by the herbage. In New Zealand they associate it with grazing on luscious rye grass pastures, but in Lincolnshire it is commonest in herds running on quickly growing pastures of poor quality. In all cases, however, the disease occurs most frequently when grazing grasses at an early stage of their growth.

THE VARIATION IN COMPOSITION OF PLANTS WHEN GROWN IN DIFFERENT SOILS AND CLIMATES

The development of symptoms following the ingestion of a poisonous plant depends on the amount eaten and the amount of toxic principle present. There is often a considerable difference in the quantity of alkaloid in plants of the same kind. Very little is known regarding the factors which determine this variation, but it may be an important factor in explaining why poisoning results follow the ingestion of a certain plant on one occasion and not on another. In the case of the tobacco plant, differences in the nicotine content

between various samples are well recognised[5], and examination of linseed cake has shown a variation in the HCN content. In some cases the difference can be explained mainly by a failure of the plant to reach maturity, and this is the reason for the decreased alkaloid production by certain semi-tropical plants grown for the production of medicinal agents in this country.

The Effect of Soils and Climate on the Toxicity of Plants.—Slight differences in the composition of soil and climatic conditions may determine whether a plant will grow and mature, *e.g.*, foxgloves are rarely found in East Anglia but are common in the west. Apart from the conditions affecting growth, there is evidence that soil and climate may affect the production of the toxic active principle.

In the case of *Atropa belladonna*, Carr[6] (1912) found a considerable variation from year to year in the alkaloid content in plants maintained in the same soil, and this may have been the effect of weather conditions. In the case of *Hyoscyamus muticus*, Dunstan (1925) showed that the hyoscyamine content for Egyptian samples varied between 0·3 and 0·4 per cent., whereas there was 0·6 to 1·2 per cent. in those from India. Further interesting information has been provided by Christopherson (quoted by Garrard[7], 1873) who claimed that hemlock grown in Scotland did not contain coniine. Esser[8] in Germany states that this is also the case in North Germany. There are indications that a sudden change in temperature may affect the composition of the plant, and this possibility should be considered. In a personally conducted experiment, it was observed that a night's frost produced a 50 per cent. decrease in the protoanemonin content of *R. hirsutus*. Noll and Haley[9] found an increase in the nicotinic content of the tobacco plant after frost, and this was attributed to the effect of the cold on the nitrogen-converting bacteria in the soil. The effect of temperature, etc., on plants after cutting is unconnected with the point at issue, but it is interesting to note that most poisonous plants remain toxic after dying; there are, however, exceptions, as in the case of Ranunculus, when hay containing injurious varieties is harmless. Little is known regarding the effects of other methods of preservation, but it has already been pointed out that the oxalic acid content of sugar beet tops falls when they are allowed to wilt, and one supposes that the making of silage would have the same effect.

Variations between Different Strains of Plants.—There is evidence to show that certain strains of plant breed true to a high or low alkaloid content and some work in this connection has been done on members of the Solanaceae. My own experience is mainly with *Conium maculatum*. Some time ago samples were collected from different geological formations in Great Britain, and they were tested by Shearer for the percentage of coniine. He found variations in alkaloid content ranging from 1·3 to 0·18 per cent. but there was no definite evidence to show that the results were affected by the soil. It is true that the figures for samples from some soils appeared to be generally lower than those from others, but even from the same soil the fluctuation was very great. This was particularly so in the case of Norwich Craig, where one contained 1·3 per cent. coniine and the other only a third of this amount, *i.e.*, 0·4 per cent. The possibility of strain variation cannot be excluded in this case.

The Development of Tolerance and Allergy to Vegetable Products

There are examples of the development of tolerance to vegetable products, and this state may develop following the ingestion of such toxic substances as taxine, *e.g.*, Nicholson[10] found that rabbits, previously treated with the alkaloid, showed no ill-effects when fed five times the lethal dose. There are no indications that tolerance plays an important part in the development of poisoning, but the possibility must always be considered. Whether or not animals can become allergic to certain vegetable products is a question which does not appear to have been seriously studied, but the occurrence of common diseases, such as blain and urticaria, obviously makes further knowledge on this subject very desirable.

The Absorption of Toxic Substances by Plants[11 12 13]

Quite apart from the fact that some plants normally contain toxic active principles the question of absorption by vegetation of poisonous elements must also be considered. Fortunately, plants almost invariably refuse to absorb foreign chemical substances. This is well illustrated in the experiments carried out in Cambridge. During the course of an investigation into fluorosis, grasses were grown on soils containing varying amounts of fluorine, and it was found that the absorption of this element remained constant. There are certain exceptions, however, in which disease can be traced to the absorption of toxic substances. Teart, a pining condition of cattle which occurs in parts of Somerset, is a good example. The aetiology of this condition remained unknown until it was found that the soil and herbage contained molybdenum, an element which causes diarrhoea even when ingested in small amounts. An interesting feature regarding this condition is that some grasses do not absorb as much molybdenum as others, and the seeding of teart lands with non-selective vegetation may be a practical solution to the problem. In America, a condition characterised by loss of horns and hoofs, cirrhosis of the liver and extreme emaciation, occurs in certain parts where the soil contains selenium. Selenium is also absorbed by plants, and severe losses have occurred in the affected district for many years. Again, some plants contain more of the element than others. Moreover, there is evidence that some plants act as "converters," obtaining selenium from soil in which it is "unavailable" to other vegetation, and through their death and decay making it "available" to other plant species.

Summary

There are certain well-known plants, *e.g.*, yew, hemlock, etc., which cause poisoning and the symptoms they produce, when ingested, and their mode of action are well understood. In addition, many shrubs and plants are suspected, on occasion, of causing a disturbance in health, when ingested, but our knowledge of these is not very satisfactory. Certain factors which may influence the toxicity of plants and some possibilities have been discussed. Apart from the question of poisoning by weeds, the part played by plants, arable crops and other vegetable products is an important subject which is often neglected in investigations into animal disease. It has also been shown that at least one disease occurring in this country, *i.e.*, "teart" is due to the absorption of foreign toxic elements on vegetation.

Acknowledgments.—The author acknowledges with thanks the assistance given him by F. Blakemore, Esq., M.R.C.V.S., D.V.S.M.

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Discussion

Mr. Shipley asked regarding the cause of sugar-beet top poisoning, which was supposed to be due to oxalic acid. He had observed cases of poisoning from sugar-beet pulp, and from the beet; he had endeavoured to work out a formula and considered it possible that the oxalic acid acting on the sugar formed alcohol and that alcohol poisoning followed. He also stated that he had experienced no ill-effects from feeding of marsh hay containing mare's tail. This speaker further enquired as to the avoidance of potato poisoning by removal of the shoots.

Mr. Wright, in reply, stated that by allowing sugar beet tops to wilt, the oxalic acid was reduced. He knew of three or four cases along the Norfolk Broads, where hay containing 10 per cent. mare's tail had caused trouble. As regards potatoes, the green shoots contained more solanin, but the tubers were not entirely free.

Mr. Muir referred to the speaker's comments regarding mustard, and asked whether the same applied to the brassicas. He had observed enteritis in lambs fed on seeded savoys which was overcome after the seeds were removed. Mr. Wright said it was considered that the flower seeds were dangerous. Mr. Turner asked whether there was any risk of poisoning from feeding *Chaeophyllum temulum*, and Mr. Wright replied that there was no evidence of it being toxic.

Mr. Swann referred to bracken poisoning and stated that although there was plenty of bracken in the area covered by his practice, and it was not uncommonly used as bedding, he had never seen a case. Mr. Wright intimated that there had been a case in the Breck country.

[The President (Mr. H. P. Standley, Junr.), having thanked Mr. Wright for his address, stated that the speaker would be pleased to discuss any problems on the botanical side before he left, and would be available later in the afternoon to deal with the demonstration he had staged, and discuss any matters members cared to raise.

After tea, many members took the opportunity of visiting Mr. Wright's exhibition in one of the laboratories, which mainly consisted of plants which had been used by Mr. Wright in his address to illustrate various points. Specimens of the following were shown: *Atropa belladonna, Conium maculatum, Chaerophyllum temulum, Althusa cynapium, Hypericum perforatum, Lychnis githago, Senecio jacoboea, Solanum dulcamara, Hyoscyamus niger, Ranunculus sceleratus, Melilotus altissima*, Equisetum species, *Oenanthe crocata*, and the seed of *Lychnis githago* and *Atropa belladonna*. Mr. Wright gave further particulars regarding these and other plants, and dealt with numerous individual enquiries.]

Weekly Wisdom

I have constantly been horrified to find historians accepting political speeches as statements of fact. Cicero's denunciations of Cataline and Mark Antony are no more sober historical documents than the combined speeches of American politicians."—"This was Cicero," H. J. Haskell.

* * * * *

In a year the Pests Department of Warwickshire W.A.E.C. has destroyed 130,000 rats. Other destructive creatures dealt with were ants and deer.

The Effects of Feeding Green and Sprouted Potatoes to Laying Pullets

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Introduction

Since the outbreak of war large quantities of potatoes have been used for poultry feeding to eke out the limited supplies of rationed concentrate feed. The suitability of cooked potatoes as a source of carbohydrates to the bird and the optimum levels of inclusion in the diets of different classes of poultry stock have been amply demonstrated by experience and experiment. Two sources of potato supply have been available to the poultry keeper: (*a*) supplies of normal quality potatoes, surplus to human requirements which have been released periodically for stock feeding and (*b*) chat and other types of potatoes regarded as unsuitable for human consumption. The latter category has included greened and sprouted tubers which owing to their poisonous nature have presented special difficulties to the poultry keeper. At the National Poultry Institute we have received numerous enquiries for advice regarding their effects when fed to poultry and methods for detoxicating the tubers. Some poultry keepers have gone to the extreme of removing the sprouts or peeling the potatoes and rejecting the skins, but on a large scale the labour required is usually prohibitive.

Toxic Principle

The berries, haulm, green sprouts and greened skin of the potato contain the poisonous alkaloid solanine $C_{52}\ H_{91}\ O_{18}\ N$, which on hydrolysis yields solanadine $C_{28}\ H_{41}\ O_2\ N$ and a molecule each of dextrose, galactose and rhamnose. Although the harmful effects are ascribed to solanine, solanadine, which may occur to the extent of 1·5 per cent. in the young green potato, is credited with morphine-like properties. The concentration of solanine in different parts of the plant appears to be associated with the intensity of green pigmentation. Esser[1] states that the solanine content of the actively growing haulm is about 0·09 per cent. which decreases to 0·037 per cent. towards the end of the summer. Young green sprouts contain up to 1·5 per cent. of the alkaloid and the content is also very high in tubers which have been greened by prolonged exposure to light. Reference to the available literature reveals little information on the specific effects of solanine when ingested by poultry although numerous cases are on record of poisoning of other species of farm livestock.

Chesnut and Wilcox[2] describes fatalities among pigs due to the consumption of sprouted uncooked potatoes. After cooking the potatoes proved innocuous and the authors contend that with sufficient boiling most of the alkaloid passes into the cooking water which might be thrown away.

Behre and Ehrecke[3] recorded cases of illness among humans during the Great War due to eating green potatoes. Analyses showed that the green parts of the skin which had a markedly bitter taste contained practically the entire solanine content of the tuber. More recently Salomon[4] gave an account of the occurrence of solanine poisoning in ducks following the feeding of cooked sprouted potatoes. When the feed was changed the symptoms disappeared immediately. The poisoned birds showed signs of opisthotonus and cramp with severe diarrhoea, and deaths occurred within 36 hours.

Pharmacological Effects

The alkaloid appears to affect principally the digestive and nervous systems, although skin lesions have been recorded. Symptoms which have been frequently mentioned for different species are enteritis, characterised by constipation, followed by a profuse diarrhoea, epidermal suppurations, dilation of the pupils, convulsions, and a slowly progressing paralysis with a fatal termination. The extent to which the solanadine is responsible for promoting the nervous symptoms does not appear to be known.

According to Cornevin[5] solanine is excreted slowly from the body and the ingestion of comparatively small quantities of the alkaloid over a long period may result in a cumulative toxicity.

Outline of the Experiment

Three groups each comprising four 18-week-old White Leghorn × Rhode Island Red pullets were used for the experiment and accommodated in individual cages in a battery house.

The following rations were fed to the groups:—

Daily Amounts per Bird in Ounces

	Group 1.	Group 2.	Group 3.
Balanced laying mash	4·0	4·0	4·0
Green potato leaves and haulm...	2·0*	—	—
Uncooked green potato sprouts...	—	2·0*	—
Cooked green potato sprouts ...	—	—	2·0*

* Dry matter approximately 0·46 oz.

The potato leaves and haulm, and the uncooked potato sprouts were finely minced before being mixed with the meal allowances and fed as wet mash. The potato sprouts fed to Group 3 were boiled in a small quantity of water which was used to make the wet mash when the sprouts were subsequently mixed with the meal. The daily rations were provided for all the groups in two feeds.

Some difficulty was experienced at the outset in persuading Groups 1 and 2 to eat the prescribed daily amounts, but after ten days they had become accustomed to the new rations, and the full quantity was consumed until the end of the experiment after 112 days. The birds did not attempt to separate the components of the rations and appeared to find both potato tops and sprouts quite palatable. The excreta by comparison with that of control birds in adjacent cages on full mash rations was of normal physical consistency throughout and at no time was there any suggestion of scouring. During the course of the experiment all the birds came into production and although the scale of the test does not permit of quantitative evaluation, the egg yield was consistent with normal expectations. No deaths occurred and the health of all twelve birds, as judged by external appearance, was unaffected by the rations fed.

Discussion

An account has been given of a feeding trial in which green potato haulm and leaves, and cooked and raw green potato sprouts were included in the rations for laying pullets at the daily rate of 2 oz. per head. During the experimental period extending over four lunar months, the palatability of the rations and the health and productivity of the birds were unimpaired by the addition of any of these materials. The proportion of greened tissue or of sprouts does not form more than 10 per cent. of the total weight of such tubers. In the case of an extreme daily diet containing 12 oz. per head of green or sprouted potatoes, the quantity of greened tissue or sprouts eaten would not exceed 1·2 oz. (fresh weight), per bird, *i.e.*, 40 per cent. less than the amounts of sprouts or haulm included in the experimental rations.

The present experience indicated no harmful effects following the prolonged intake of solanine and it would seem that poultry keepers with access to supplies of green or sprouted potatoes can safely feed them to adult birds. The results of recent laboratory[6] and field trials[7] have clearly demonstrated that where potatoes are used for poultry feeding they should be cooked as raw potato starch is poorly digested by fowls. If therefore as an additional precaution the residual water from the cooking of green or sprouted potatoes is discarded, the poultry keeper can confidently feed them to his stock without the necessity of first removing the sprouts or greened tissue.

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The rapidity with which grading up to a high-producing pure breed can be effected is probably not fully appreciated by those who have not seen it in practice. A low-producing nondescript herd can in two generations be made into a herd of quite reasonably good production and type by grading up with high-producing, pure-bred bulls. The movement for the better breeding of dairy cattle would be given a great impetus if all dairy cattle Breed Societies would institute a "grading-up" herdbook, either with or without entry into their present herdbook.—Dr. John Hammond.

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A warning against selling the best mares to breeders anxious to produce weight-carrying hunters rather than pure stock, was given at a recent meeting of the Council of the Cleveland Bay Horse Society.

CLINICAL COMMUNICATION

Blackquarter in Ewes Caused by Cl. Chauvoei

By

W. LYLE STEWART, ERNEST GRAY

AND

O. STINSON

On certain hill farms in the Northern Counties sudden losses occur among sheep shortly after moving them from the fells to in-bye land, and also occasionally on their return to the fell after lambing. These losses are of interest and importance but for various reasons it is often difficult to arrive at a definite diagnosis. Many are undoubtedly due to metabolic disorders, while other cases show symptoms resembling an infective disease. Thus Cumberland shepherds recognise a disease of ewes and hoggs termed "paddock bite," the symptoms of which are dullness, inappetence and the presence of a spongy swelling under the jaw or in the shoulder, flank or thigh. This disease, which is in all probability a *Cl. chauvoei* infection, may only account for an occasional sheep, or flare up into an enzootic. The purpose of this note is to record the isolation of *Cl. chauvoei* from a ewe which died under the following circumstances.

A flock of ewes on a Westmorland hill farm were moved in April from their fell to in-bye fields. They were dipped the following day. Two days later three ewes were noticed to be stiff, and a fourth was in a very weak state. All four ewes died within the next 24 hours. With one exception they were six-year-old sheep and all were pregnant. Oedema of the head was reported in all cases, and the carcase of one animal had a sweetish odour. No abnormal temperature was observed before death. The owner stated that in all cases a bloody discharge from the nostrils was observed immediately before death.

No such losses had occurred on the farm previously. This year a similar clinical condition has been met with elsewhere after castration, docking, ear-marking and clipping. The incidence has been greater than in previous years. One some farms cases occurred for the first time. The majority of the affected flocks were large and in most were grazing over pastures which have recently been dressed with artificial manures.

One of the dead ewes was brought to the laboratory and examined within five hours of death. The carcase was greatly swollen and the subcutaneous tissues were infiltrated by blood-stained oedematous fluid, particularly in the pectoral, neck and head regions, where much of the muscle tissue resembled black mince. Blood-stained fluid was present in the serous cavities, and the heart presented a sub-acute pericarditis. The spleen was thickened but not enlarged and the kidneys were congested and petechiated. No gross lesions were detected in either the liver or the intestines. There was no evidence of cutaneous wounds or bruising in any part of the body.

Smears of muscle juice and serous fluid from the blackened inflamed pectoral and submaxillary regions revealed numerous pleomorphic rod-shaped bacilli and oval spores. A toxicity test of intestinal contents upon mice proved negative. Cultures of portions of the blackened muscle tissue and of the peritoneal fluid in glucose agar shakes yielded *Cl. chauvoei* in impure culture. This was purified by immediate guinea-pig inoculation and the diagnosis clenched by biochemical reactions. From material sent to the Wellcome Laboratory Dr. Montgomerie also isolated *Cl. chauvoei*, and thus confirmed the diagnosis.

In all probability blackquarter in sheep may be caused by *Cl. septique* or *Cl. chauvoei* and may be confused by *Cl. welchii* infections. Exact diagnosis is important and for this purpose portions of the diseased muscle should be placed in sterile containers and despatched by express post to the nearest veterinary laboratory.

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ABSTRACTS

[AN EXPERIMENT WITH SULPHAGUANIDINE IN THE TREATMENT OF NATURALLY ACQUIRED BOVINE COCCIDIOSIS. BOUGHTON, D. C., and DAVIS, L. R. (1943.) *Amer. J. vet. Res.* 4. 150.]

Continuing Boughton's earlier work (*Amer. J. vet. Res.* 1943. 4, 66-72), the authors bought twelve Jersey calves at three to seven days old and placed them in pairs similar in age, weight and sex with ten older cattle some of which were known to have had mixed coccidial infections. The faeces of these older cattle were allowed to accumulate on the straw bedding for several weeks before the experimental calves were admitted and this straw was periodically spread over the pasture. All the animals were crowded at night into a barn with 300 feet floor space. One calf of each pair was given 30 grammes of sulphaguanidine every other week, each dose being given in 5 gramme portions suspended in water and fed by nipple just before the morning and evening feedings on three successive days. Five of the treated calves received 150 grammes of sulphaguanidine in all and the sixth had 160 grammes. The remaining six calves had no drug treatment.

Two of the treated calves died of pneumonia, neither of them having a significant coccidial infection. Four of the untreated calves died; two of them probably died of pneumonia; the deaths of the other two were directly due to coccidiosis. The gain in weight of the treated calves was only a little higher than that of the untreated ones, but the severe conditions of the experiment did not favour growth. There was little difference between the diarrhoea of the treated and untreated calves.

All the calves passed oöcysts, but the untreated ones passed considerably more of them. The authors conclude that, under the severe experimental conditions imposed, sulphaguanidine effectively reduced the severity of the coccidial infections and they claim that as Boughton's earlier work has indicated, this drug is effective against some types of bovine coccidiosis, especially if it is given when the asexual reproduction of the coccidia is under way. They think that better results might have been obtained if the drug had been given at shorter intervals.

A given species recurred in the same host, so that a previous infection did not protect the host from later infections. *E. zürnii* and *E. bovis* are probably the most likely species to cause bloody diarrhoea and death. G. L.

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[IDENTIFICATION OF EGGS OF NEMATODES PARASITIC IN DOMESTIC SHEEP. KATES, K. C., and SHORB, D. A. (1943.) *Amer. J. vet. Res.* 4. 54-60.]

A detailed description is given of the eggs of the different species of nematode parasites of sheep. The differences described are often slight and as variations occur within the species it is probable that it would be easier for non-specialising workers to differentiate the species present by the more usual method of examining the infective larvae from faecal cultures. The larvae can be differentiated by simple measurements. The eggs of such genera as *Nematodirus*, *Strongyloides*, *Trichuris* and *Capillaria* are, of course, readily recognised.

The paper, which is well illustrated with a number of good microphotographs, should be read in the original by those interested as it contains much detailed information which cannot readily be dealt with in an abstract.

J. S. S.

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[DEVELOPMENT OF THE THORN-HEADED WORM, MACRACANTHORHYNCHUS HIRUDINACEUS, IN ITS INTERMEDIATE HOST. KATES, K. C. (1943.) *Amer. J. vet. Res.* 4. 173-181.]

A brief account is given of the developmental stages of the worm in its intermediate host. These were obtained by feeding eggs in soil to final instar grubs of *Cotinus nitida* and grubs of several species of May beetles of the genus *Phyllophaga*. Development under natural conditions took three months. The various stages are illustrated by drawings and microphotographs. [This worm does not occur naturally in the United Kingdom.]

J. S. S.

The core of the Hot Springs Conference recommendations was a full diet for all mankind and the pooling and developing of our resources to provide it. By general consent a full nutritional policy for the country would revolve round an adequate supply of fresh milk. . . . We should need an increase of 65 per cent., or 700 million gallons a year more than we produced before the war. This would mean keeping at least a million more dairy cows and their followers.—*Farmers' Weekly.*

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 27th.—R.C.V.S. Committee and Council Meetings, 16, Bedford Square, W.C.1.

Sept. 28th.—Meeting of Council, N.V.M.A., Connaught Rooms, Great Queen Street, Kingsway, W.C.2.

Sept. 28th.—Special Meeting of the Society of Women Veterinary Surgeons, Friends House, Euston Road, N.W.1, 3 p.m.

Sept. 28th.—Meeting of the Veterinary Inspectors' Association, at the London School of Hygiene and Tropical Medicine.

Sept. 29th.—Meeting of the V.V.B.F. Ladies' Guild, at the London School of Hygiene and Tropical Medicine, 11 a.m.

Sept. 29th and 30th.—**N.V.M.A. Annual Meeting and Conference, London School of Hygiene and Tropical Medicine.**

Oct. 6th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

Oct. 7th.—Annual Meeting of the Central Veterinary Society, Conway Hall, Red Lion Square, W.C.1, 2 p.m.

Oct. 7th.—Special Meeting of the South-Eastern Division, N.V.M.A., at Maidstone, 2.30 p.m.

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N.V.M.A. Annual Meeting and Conference

APPLICATIONS FOR TICKETS

Members are reminded that those who have not yet applied for luncheon and reception tickets have very little time left in which to do so. *Next Monday, September 27th, is the last day on which applications can be received.*

We are pleased to be able to inform members that the principal guest at the luncheon will be Mr. P. A. Kerstens, Minister of Agriculture and Fisheries, Netherlands Government.

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PROGRAMME OF PROCEEDINGS

TUESDAY, SEPTEMBER 28TH

At the Connaught Rooms, Great Queen Street, W.C.2.

2.30 p.m.—Council Meeting (*for members only*).

At the Waldorf Hotel, Aldwych, London, W.C.2.

8.30 p.m.—President's Reception.

WEDNESDAY, SEPTEMBER 29TH

At the London School of Hygiene, Keppel Street, W.C.1, in the Main Lecture Theatre.

10.0 a.m.—Annual General Meeting:
Notice convening the meeting.
Welcome to foreign delegates.
Presidential address: "THE VETERINARY PROFESSION AND THE NATION."
(*Adjournment of A.G.M. to September 30th, at 2.30 p.m.*)

11.0 a.m.—Paper: "THE VETERINARY SURGEON IN THE DEVELOPMENT OF THE COLONIES" by *Major J. M. Smith, O.B.E., M.R.C.V.S.*, formerly Chief Veterinary Officer, Department of Agriculture and Fisheries, Government of Palestine.
Opener: *Professor W. Kearney, M.R.C.V.S.*, of the Veterinary College of Ireland, Dublin. Many people of Colonial experience are expected to join in the discussion, including Mr. John Smith and Professor Leiper, F.R.S.

11.0 a.m.—Meeting of the V.V.B.F. Ladies' Guild in Room 103.

At the Connaught Rooms, Great Queen Street, W.C.2.

12.45 p.m. for 1 p.m.—Association's Luncheon.

At the London School of Hygiene, Keppel Street, W.C.1.

3.0 p.m.—Continuation of the discussion on paper: "THE VETERINARY SURGEON IN THE DEVELOPMENT OF THE COLONIES."

THURSDAY, SEPTEMBER 30TH

At the London School of Hygiene, Keppel Street, W.C.1.

10.0 a.m.—Paper: "THE IMPROVEMENT OF LIVESTOCK" by *Professor Robert Rae, B.Agr., C.D.A.*, of the University of Reading.
Openers:
Colonel E. M. Curley, Chief Veterinarian, U.S.A. Army in the European Theatre of Operations.
Dr. Tj. Bakker, representing the Netherlands Government.
Mr. S. L. Hignett, B.Sc., M.R.C.V.S., of the Wellcome Physiological Research Laboratories.

1.0 p.m.—Close of Conference.

2.30 p.m.—Adjourned Annual General Meeting (*for members only*), to be immediately followed by brief meeting of Council members for 1943-1944.

R.C.V.S. Returns to London

We are notified by the Royal College of Veterinary Surgeons that on and after Monday next (September 27th, 1943) the address of the office will be 9 and 10, Red Lion Square, London, W.C.1.

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ADDRESSES WANTED

The Registrar, R.C.V.S., is anxious to obtain the present addresses of the following members. Letters sent to their registered address have been returned marked "gone away."

Last known address

Brown, John Joseph, Chorley, Lancs.
Cooper, William James, 83, Dawson Crescent, Welling.
Crapp, Arthur, c/o Lawson Elliott & Lawson, 31, Wood Street, E.C.2.
Devine, E. Joseph, 123, Pepys Road, Wimbledon, S.W.20.
Dudgeon, David, 20, Argyle Square, Sunderland.
French, James Anthony, Port Chaplain, Posterngate, Hull.
Hewson, Fred, Lower Farm, Throcking, Buntingford, Herts.
Jobson, Kenneth McGregor, 2, Bridge Terrace, Berwick-on-Tweed.
Jones, Arthur Humphreys, 12, Imperial Road, Exmouth, Devon.
Kerr, Kinley, The Haven, 40, Fourth Avenue, Baylands, Bangor, Co. Down.
Lalor, A. D., North Lodge, Sleaford, Lincs.
Maclean, Duncan, 16, Park Road, Portree, Isle of Skye.
Meegan, Peter Aloysius, Glenoe, Divis Drive, Belfast.
Morrison, Alexander McKenzie, 59, Clyde Street, Cliftonville, Coatbridge, Lanarks.
Murison, Robert Edward, Conway House, Skirbeck Road, Boston, Lincs.
Neale, William Walter Raymond, c/o Barclays Bank, Royston, Herts.
Rice, John Patrick, Veterinary Inspector, Veterinary Department, Parliament Buildings, Stormont, Belfast.
Shaw, Gordon Davidson, 18, Dovedale Road, Wallasey, Cheshire.
Tabuteau-Herrick, Henry Gordon, Rock Lodge, Fleet, Hants.
White, Munro Erskine, The Laurels, Petersfield, Hants.
Woodrow, C. Erskine, 12, Chiswick Lane, Chiswick, W.4.

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VETERINARIAN COMMANDO'S AWARD FOR BRAVERY IN SICILY

The Military Cross for conspicuous gallantry and devotion to duty during operations in Sicily has been awarded to Capt. Charles Searle Head, M.R.C.V.S., eldest son of Lieut.-Col. A. S. Head, C.M.G., and Mrs. Head, of Helston.

In a letter to Capt. Head's parents, the commanding officer of his unit stated that the captain gave a magnificent performance in the operations in which he was wounded. He showed fine leadership, coolness, and determination. We learn that Capt. Head was somewhat severely wounded in the leg and has, since the early days of the Sicilian campaign, been in hospital somewhere in North Africa. It is understood that he is making slow but satisfactory progress.

Before the war Capt. Head was in practice with his father at Helston. As an officer in the Territorial Army he was called for service when war broke out, and for some time he has been in a Commando unit, of which he is now the adjutant. He took part in raids in Norway and at Dieppe before seeing active service in Egypt and Libya.

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PERSONAL

Colonial Veterinary Service.—Mr. T. Threlkeld, B.Sc., M.R.C.V.S., Veterinary Officer, Jamaica, has been appointed Senior Veterinary Officer, Jamaica.

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Will.—HIBBARD, Major Thomas, M.R.C.V.S., O.B.E., of Shepherdswell, Kent (net personalty £237), £22,422.

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THE INSPIRATION OF JOHN HUNTER IN THE ART OF SURGERY

Choosing as his subject "The Forces Behind Specialism in Surgery," Mr. Victor Bonney, Consulting Obstetrical and Gynaecological Surgeon to the Middlesex Hospital, in his Hunterian Oration for 1943 at the Royal College of Surgeons of England, says:—

"Although the average size of the frontal portion of the cerebrum of primeval man was, and of a few existing aborigines still is, smaller than ours, the size of it in the higher races has not altered

within historic time, in spite of the enormous increase in the number of things known. If every new increment of knowledge required new neurons to be added to the frontal lobe, then comparing what I, as a student, had to learn with all that the student of to-day has to master, the head of the latter would resemble a pumpkin. All other organs of the body enlarge with use, but the cerebrum is the exception, or at least the process is so slow that ages are required to make it perceptible.

"From these and other considerations and the fact that a considerable area of the frontal cortex may be removed without impairing the intelligence, it seems clear that, of the multitude of higher units which the brain contains, only a proportion are ever trained, correlated and put into action, even by the most active minded, the remainder forming a reserve which can be drawn upon, provided that the *time* and *material* necessary for their training are *coincidently* available—and, of course, that the will to put them into action is forthcoming.

"This time-material coincidence constitutes opportunity, and opportunity is the factor which limits the acquirement of knowledge before the absolute potentiality of the brain is reached, but the limitation is variable. Thus there are certain kinds of knowledge the opportunity to acquire which is large and constant so that many persons can avail themselves of it. Conversely there are other kinds, the opportunity to acquire which is so small and inconstant that few can ever partake of it and consequently, in these kinds of knowledge, the number of the expert must always be small."

After a learned historical analysis, Mr. Bonney continues: "I have traced the course of specialism in surgery and shown that it is only one expression of that universal specialisation which has been forced on man's intellectual activity by the shortness of life and the limitations imposed by opportunity. If its appearances and development were compelled solely by the pressure of circumstances, there would be little to be proud about, but there is another aspect to be considered. Will is the motive power which puts the intellect into spontaneous action. When existing for the sake of the thing itself we call it aspiration; when aroused for the sake of what the accomplishment will bring, we call it ambition. The one is an impulse of the spirit, the other a product of the reasoning mind; but without the goad of one or the other nothing much has ever been achieved. . . ."

"Certain rare lives," Mr. Bonney concludes, "epitomise and give form to the shadowy aspirations common to most men, and among this unseen company which crowds around us here John Hunter stands supreme; not for what he discovered or even for the vast material he left us, but because the intense spiritual force of his example has crystallised about his memory the ideal of the host of surgeons treading after him, until, transfigured into a concept of the perfect surgical life, it has become the great tradition which guides and inspires our calling. He bestowed on surgery a religion, whose service gathers all its units together; the units which, like tessarae, are by themselves of small account, but cemented side by side make up the magnificent mosaic of the Art of Surgery."—*Lancet*, 1943, May 29th.

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BOVINE TUBERCULOSIS IN SOUTH AFRICA

In a letter published in the *British Medical Journal* (1943, June 5th, p. 708) Dr. Basil F. Sampson, M.B., Durban, draws attention to the extremely low incidence of human tuberculosis of bovine origin in South Africa, only three cases having been discovered during the last ten years in spite of diligent search. The typical non-pulmonary lesions of the disease are not commonly seen in human patients by surgeons in South Africa.

It is difficult to determine what is the real cause of this low incidence, and it cannot readily be assigned, the writer says, to a particularly low prevalence of bovine tuberculosis or to a low percentage of cows excreting tubercle bacilli. Ten years ago, over 30 per cent. of reactors were discovered among cows in the Durban area; 2·5 per cent. of cows in the Johannesburg area have been found to be excreting the bacilli. The "Toronto results" are being obtained, the writer observes, in South Africa without pasteurisation or heat treatment of any kind. Milk is consumed by the vast majority of the people in the raw state, and the standard of general cleanliness, the milk being handled by native milkers, is not very high. Dr. A. H. Macdonald is quoted as probably holding the view that the human population is being maintained immune through constantly consuming small numbers of tubercle bacilli, while our veterinary colleague, Mr. E. J. Pullinger, of the Johannesburg municipal abattoir, is said to hold the belief that the explanation can be found in the relatively few infected cows which become excretors of tubercle bacilli in South Africa. Yet, as the writer fairly contends, where there are 2·5 per cent. of cows excreting the bacilli there might be a higher proportion of the human population infected than is actually revealed. The explanation offered by Mr. Pullinger, considering the mode of maintenance of the cattle, possibly will reflect the position in a country like South Africa taken as a whole, as it ought also perhaps in India, where, however, for some reason, the proportion of cases in the human population caused by tubercle bacilli of bovine origin is not specially low. Whatever the true explanation, no one can deny that the subject is one of profound importance and any further light that can be thrown upon it by research in South Africa will be welcomed. It is worth recalling that our colleague Dr. Carmichael's researches in Uganda, following upon those carried out a few years ago in India, showing the wide distribution of tuberculosis among the local Ankole cattle, which are kept always in the open, and the rarity among the Zebu cattle, all pointing to marked differences in the natural immunity of these two bovine types to tuberculosis, are contributions of fundamental importance from that region of the world to our understanding of the natural history of tuberculosis.

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MEAT INDUSTRY BY-PRODUCTS

Scientific research is adapting many of the meat industry's by-products to war uses, and in a recent issue *The Meat Traders' Journal* quotes Dr. H. H. Young, Swift and Company chemist, on this matter as follows: Animal tissues, glands, inedible fats, hoofs, horns, bones, hides and wool "are going to war in many forms and packages." In the field of pharmaceuticals research has made astounding developments, with many of the ingredients produced from meat animals saving lives on the battle fronts. Among these are lecithin and cephalin, derived from animal brain tissues and which are used in treating reptile bites and promoting blood clotting; intestines used in making sutures; and adrenalin, derived from suprarenal glands, which makes bloodless surgery possible. A special soap necessary for synthetic rubber manufacture has come out of the meat industry laboratories, and the chemist estimated 100,000,000 pounds eventually will be utilised annually.

Other by-product uses listed by Dr. Young included: gelatine, from animal bones, is used in the manufacture of photographic films for reconnaissance purposes and for the manufacture of smokeless gun-powder, among many other uses. Soap and glycerine, derived from inedible fats, and having wide use as lubricants; nitroglycerine, gun-powder, cordite and dynamite, also bone ash is needed in copper smelting, and special bone powders are effective in removing fluorine from drinking water. Hoof and horn meal, as well as summer hog hair, have found wide usage in Great Britain for making foam type fire extinguishing fluids. Hog hair also goes to make aviators' cushions.

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FAUNA AND FLORA: CO-ORDINATING AUTHORITY NEEDED

The Universities' Federation for Animal Welfare, 284, Regent's Park Road, Finchley, has issued a memorandum urging the need for the creation of a wild-life authority for Great Britain, in the hope that discussion of the proposal may lead to steps for implementing it by statute.

Sections of the nation concerned in British wild fauna, it suggests, could be divided into economic, commercial, humanitarian, and cultural groups of interests, and other bodies interested in the preservation of amenities.

At present, the memorandum states, there is no central co-ordinating authority for arbitrating between the conflicting demands of the interested parties. A wild life authority set up by statute could make available a body of sound ecological knowledge as a basis for the regulation of fauna and flora; promote the conservation of rare, beneficial, and aesthetically valuable British species in collaboration with existing organisations for this purpose; regulate harmful species on a quantitative basis; and develop and bring into use humane methods of fauna control in collaboration with appropriate humanitarian organisations.

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THE NATIONAL STUD

By agreement between the Governments of the United Kingdom and Eire, it has been decided that the National Stud, hitherto conducted by the United Kingdom Government at Tully, County Kildare, shall in future be carried on in the United Kingdom, to which the bloodstock has been transferred. The bloodstock will in future be housed at the Gilltown Stud, Gillingham, Dorset, which has recently been acquired by the United Kingdom Government for the purpose. Arrangements are being made to hand over the land and buildings at Tully to the Eire Government. Various matters of detail arising out of these arrangements are still under discussion between the two Governments.